

# Spin information

+ a little about PHENIX DB/Star Scalers

\* Many parts of contents borrowed from Ciprian G., Scott W., and Yoshi F.

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# Outline

- Access PHENIX database
  - Simple psql commands
- Spin database
  - What is it?
  - What you can get
  - How to access
  - Caveats
- Star Scalers

# Access PHENIX database

This part is prepared thanks to Daniel J.

- PHENIX DBs

- <https://www.phenix.bnl.gov/WWW/offline/wikioff/index.php/Database>

- To access,

`[rcas]$ psql -h "DB_SERVER" "DB_NAME"`

ex. `$ psql -h phnxdb1.phenix.bnl.gov daq` ← access "daq" in "phnxdb1.phenix.bnl.gov"

- To list,

`\d`

- To quit,

`\q`

```
[ckim@rcas2071 al]$ psql -h phnxdb1.phenix.bnl.gov daq
psql (9.2.4, server 8.4.1)
WARNING: psql version 9.2, server version 8.4.
Some psql features might not work.
Type "help" for help.

daq=> \d

          List of relations
Schema |          Name          | Type  | Owner
-----+-----+-----+-----
public | bbcll1thresh           | table | phnxrc
public | beamxcounters          | table | phnxrc
public | bufferbox              | table | phnxrc
public | ccfttransfer            | table | phnxrc
public | ccjtransfer            | table | phnxrc
public | cpuusage               | table | phnxrc
public | dcmlist                | table | phnxrc
public | fvtx_fibers_latched    | table | phnxrc
public | fvtx_fibers_latched_version | table | phnxrc
public | fvtx_fphx_mask         | table | phnxrc
public | fvtx_fphx_mask_version | table | phnxrc
public | fvtx_fphx_status       | table | phnxrc
public | fvtx_fphx_status_version | table | phnxrc
public | fvtx_scalars           | table | phnxrc
public | fvtx_trig_window_size  | table | phnxrc
```

```
daq=> \d bbcll1thresh
          Table "public.bbcll1thresh"
  Column | Type  | Modifiers
-----+-----+-----
runnumber | integer | not null default 0
channelnb | integer | not null
t1thresh | integer |
t2thresh | integer |
Indexes:
    "bbcll1thresh_pkey" PRIMARY KEY, btree (runnumber, channelnb)

daq=> \d beamxcounters
          Table "public.beamxcounters"
  Column | Type  | Modifiers
-----+-----+-----
runnumber | bigint | not null default 0
beamx0bbr | bigint |
beamx1bbr | bigint |
beamx0abr | bigint |
beamx1abr | bigint |
beamx0ber | bigint |
beamx1ber | bigint |
beamx0aer | bigint |
beamx1aer | bigint |
Indexes:
    "beamxcounters_pkey" PRIMARY KEY, btree (runnumber)
```

# Access PHENIX database

- PHENIX DBs

```
daq=> select run.runttype from run where(run.runnumber = 367593);
runttype
-----
PHYSICS
(1 row)
```

- To query, after DB access

*"DB\_NAME"=> **select "TABLE"."VARIABLE" from "TABLE" where ("CONDITION");***

ex. *daq=> select run.runttype from run where (run.runnumber = 367593);*

- \* This will also spit out something as well:

*"DB\_NAME"=> **select "VARIABLE" from "TABLE" where ("CONDITION");***

but I don't recommend as it's NOT specific. Better safe than sorry

- The "CONDITION" can be much more complicated in real life...

ex. This will give you fill number of blue beam with conditions of ' pp510 + Physics + Run13 period '

*select distinct temp.fillnumberblue from*

*(*

*select run.fillnumberblue,run.runnumber from run where*

*(*

*(run.triggerconfig like '%PP510%' and run.runttype = 'PHYSICS') and*

*(run.brtimestamp > '01 Jan 2013' and run.brtimestamp < '01 Jan 2014')*

*)*

*)*

*as temp order by temp.fillnumberblue;*

- You can find good documentation in here: <http://www.postgresql.org/docs/8.2/static/sql-select.html>

# Access PHENIX database

- You can access it directly through: psql commands, script, and C++ (ROOT)

- Example of psql command works in RCF/script:

*psql -t -d daq\_phnxdbrcf2\_A -U phnxrc -c "QUERY";*

ex.

*psql -t -d daq\_phnxdbrcf2\_A -U phnxrc -c "select run.runtype from run where (run.runnumber = 367593)";*

- Example by using bash script:

*phnxrc@va019.phenix.bnl.gov:/home/phnxrpc/danielj/utility\_scripts/combine\_fills\_run13.sh*

- Example by using root:

[https://www.phenix.bnl.gov/viewvc/viewvc.cgi/phenix/online/analysis/rpc/rpc\\_qa/process\\_pdst.C](https://www.phenix.bnl.gov/viewvc/viewvc.cgi/phenix/online/analysis/rpc/rpc_qa/process_pdst.C)

\* Check from 139<sup>th</sup> lines ↑

- Usually DBs can be accessed from RCF, but some DBs only can be accessed from PHENIX machines (ex. va019)

# Spin DB What is it?

- For any kind of spin (or asymmetry) analysis you need:  
fill pattern, spin pattern, beam polarization, etc.
- Official spin information of Spin PWG
- **CDEV, V124 → spin\_oncal, spin\_daq → (+ QA) → spin DB**
  - Two ways to get the raw information from collected data
    - CDEV: CAD transmit to each experiment at the beginning of every fill. This is basically a statement how they intend to fill each beam WRT spin pattern
    - V124: automatically generated when the ring is actually filled. Once we have spin pattern we use out triggers to determine where the first bunch exist in our data
  - spin\_oncal for spin related info (Spin pattern, etc), spin\_daq for GL1p info (Bbc/Zdc)
- Beware the spin information measured at IP12. NOT PHENIX
- Most importantly, do NOT trust this information blindly

# **Spin DB** What you can get

- Fill number
- Run number
- **Crossing shift (XingShift)**
- QA info
  - QA level (level of QA for stored data. Current = 2)
  - Bad run (Run QA, 0:good, 1:bad) – usually empty
  - Bad bunch (Bad bunch QA, 0:good else:bad)
- Beam polarization info: for each beam (Blue/Yellow),
  - Polarization value and its error (both statistic/systematic)
  - Polarization's transverse component (both horizontal/vertical) value and its error
- **Spin pattern**
- GL1p scaler counts
  - BBCLL1 w/wo vtx cut
  - ZDCLL1 wide/narrow cut

# Spin DB    How to access

- Access by psql query: in RCF,
  - `psql -h phnxdb1.phenix.bnl.gov spin, then \d spin`
- Library uspin
  - <https://www.phenix.bnl.gov/viewvc/viewvc.cgi/phenix/offline/packages/uspin/>
  - A sample macro written by Y. Fukao (10 years old, but still intact and works well):  

```
/phenix/WWW/p/draft/fukao/SpinDB/SpinDBSample.C
```

to run,  

```
root[0] gSystem->Load("libuspin.so");  
root[1] .x SpinDBSample.C(Runnumber_Start, Runnumber_End)
```
  - Also a little “messy” example of mine which returns result in root file:  

```
/direct/phenix+scratch/ckim/al/AccessSpinDB.C
```
- Library SpinDBUpdater
  - <https://www.phenix.bnl.gov/viewvc/viewvc.cgi/phenix/offline/analysis/SpinDBUpdater/>
  - Mainly developed to update the DB, but it has all getter methods in uspin you need

# Spin DB

## How to access

- Result of example (Y. Fukao) macro running

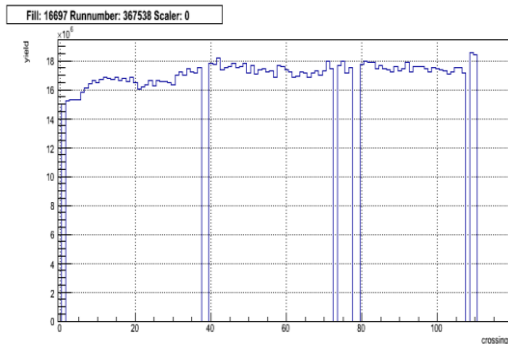
```
-rw-r--r-- 1 ckim rhphenix 1891 Jul 31 18:23 SpinDBSample.C
[ckim@rcas2071 al]$ root -l
root [0] gSystem->Load("libuspin");
root [1] .x SpinDBSample.C(367593, 367593);
Run number = 367593
Fill number = 16698
Bad run QA = 0
Crossing shift = 5
 0 : 40341989 21488463 3557666 7116078 : 1 1 : 0 : 0.549 +- 0.030 : 0.566 +- 0.066
 1 : 0 0 0 0 : -1 1 : 0 : 0.549 +- 0.030 : 0.566 +- 0.066
 2 : 41701381 22079337 3755871 7570437 : 1 -1 : 0 : 0.549 +- 0.030 : 0.566 +- 0.066
 3 : 40880111 21656569 3640513 7319185 : -1 -1 : 0 : 0.549 +- 0.030 : 0.566 +- 0.066
 4 : 40958667 21639555 3661554 7401812 : -1 1 : 0 : 0.549 +- 0.030 : 0.566 +- 0.066
 5 : 41404723 21762224 3760171 7663053 : 1 1 : 0 : 0.549 +- 0.030 : 0.566 +- 0.066
 6 : 43722593 22810525 4105666 8485120 : -1 -1 : 0 : 0.549 +- 0.030 : 0.566 +- 0.066
 7 : 45277562 23638793 4337955 8955714 : 1 -1 : 0 : 0.549 +- 0.030 : 0.566 +- 0.066
 8 : 44144409 22976433 4194853 8693007 : 1 1 : 0 : 0.549 +- 0.030 : 0.566 +- 0.066
 9 : 44625485 23137416 4282946 8961123 : -1 1 : 0 : 0.549 +- 0.030 : 0.566 +- 0.066
10 : 45785009 23654576 4472812 9418249 : 1 -1 : 0 : 0.549 +- 0.030 : 0.566 +- 0.066
11 : 44581068 22991527 4308608 9097050 : -1 -1 : 0 : 0.549 +- 0.030 : 0.566 +- 0.066
12 : 43858416 22649597 4211830 8869382 : -1 1 : 0 : 0.549 +- 0.030 : 0.566 +- 0.066
13 : 42534743 21976495 4029598 8475227 : 1 1 : 0 : 0.549 +- 0.030 : 0.566 +- 0.066
14 : 43994919 22633416 4247328 9000535 : -1 -1 : 0 : 0.549 +- 0.030 : 0.566 +- 0.066
15 : 43511392 22400326 4181634 8838576 : 1 -1 : 0 : 0.549 +- 0.030 : 0.566 +- 0.066
16 : 42200224 21716492 3991300 8421779 : 1 1 : 0 : 0.549 +- 0.030 : 0.566 +- 0.066
17 : 44680216 22961508 4358866 9240029 : -1 1 : 0 : 0.549 +- 0.030 : 0.566 +- 0.066
18 : 44460401 22920411 4312966 9119123 : 1 -1 : 0 : 0.549 +- 0.030 : 0.566 +- 0.066
19 : 46539153 23938121 4635094 9860122 : -1 -1 : 0 : 0.549 +- 0.030 : 0.566 +- 0.066
20 : 46664660 23942468 4666115 9980443 : -1 1 : 0 : 0.549 +- 0.030 : 0.566 +- 0.066
21 : 46078365 23653201 4607205 9835000 : 1 1 : 0 : 0.549 +- 0.030 : 0.566 +- 0.066
22 : 46240098 23654436 4645659 9968218 : -1 -1 : 0 : 0.549 +- 0.030 : 0.566 +- 0.066
23 : 47288417 24128829 4819068 10386943 : 1 -1 : 0 : 0.549 +- 0.030 : 0.566 +- 0.066
24 : 47162918 24064834 4795350 10356676 : 1 1 : 0 : 0.549 +- 0.030 : 0.566 +- 0.066
25 : 46241975 23638415 4636805 9953229 : -1 1 : 0 : 0.549 +- 0.030 : 0.566 +- 0.066
26 : 45916986 23505063 4580829 9804417 : 1 -1 : 0 : 0.549 +- 0.030 : 0.566 +- 0.066
27 : 46308237 23723011 4640648 9929743 : -1 -1 : 0 : 0.549 +- 0.030 : 0.566 +- 0.066
28 : 47288413 24187269 4798580 10321244 : -1 1 : 0 : 0.549 +- 0.030 : 0.566 +- 0.066
29 : 47664976 24383533 4858907 10433249 : 1 1 : 0 : 0.549 +- 0.030 : 0.566 +- 0.066
30 : 45216460 23175011 4472747 9565580 : -1 -1 : 0 : 0.549 +- 0.030 : 0.566 +- 0.066
31 : 47178699 24025716 4813867 10493123 : 1 -1 : 0 : 0.549 +- 0.030 : 0.566 +- 0.066
32 : 47019475 23959433 4791379 10419315 : 1 1 : 0 : 0.549 +- 0.030 : 0.566 +- 0.066
33 : 47337249 24209005 4819853 10419914 : -1 1 : 0 : 0.549 +- 0.030 : 0.566 +- 0.066
34 : 47629356 24333043 4870169 10547518 : 1 -1 : 0 : 0.549 +- 0.030 : 0.566 +- 0.066
35 : 49270806 25198590 5122471 11079136 : -1 -1 : 0 : 0.549 +- 0.030 : 0.566 +- 0.066
```

# Spin DB Caveats – Existing Spin DB QA

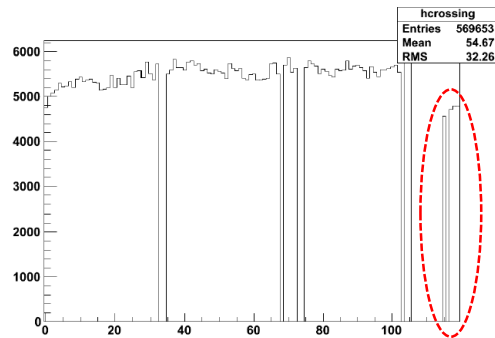
- Spin DB QA
  - First things first: for Run 12/13, thorough QA note exist
    - Run12: [http://www.phenix.bnl.gov/WWW/p/forms/info/show\\_note.php?editkey=an1096](http://www.phenix.bnl.gov/WWW/p/forms/info/show_note.php?editkey=an1096)
    - Run13: [http://www.phenix.bnl.gov/WWW/p/forms/info/show\\_note.php?editkey=an1125](http://www.phenix.bnl.gov/WWW/p/forms/info/show_note.php?editkey=an1125)
  - The info in Spin DB are updated values after these QA
  - QA items:
    - Existence of the information in the DB
    - Polarization values' match between values in the DB and official released values
    - Spin patterns/crossing shifts consistency between all runs within a given fill
    - GL1p scaler values' match to the other scaler for each run

# Spin DB Caveats – Crossing shift calibration

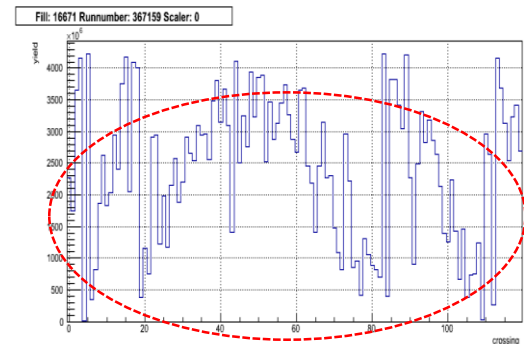
- Crossing shift calibration
  - We need to find where is the first bunches in our data by using our trigger system
  - Usual crossing shift is **5** (= first bunch exist in crossing #5). But NOT always.
  - Usually last 9 bunches (110 ~ 119) are empty for the beam dump (**abort gap**)



Normal



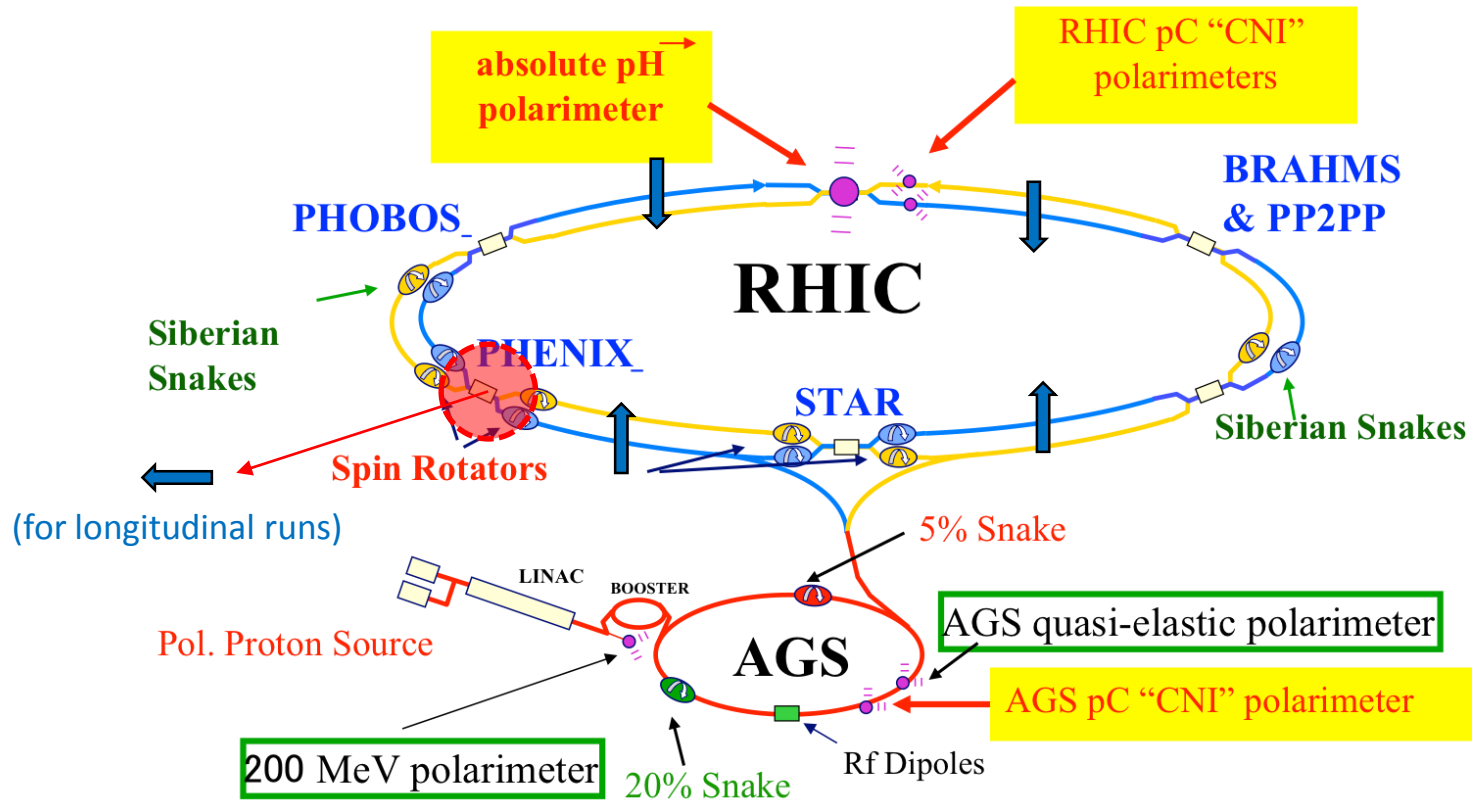
Shift correction failed



Bad run

- Be careful when you use uspin library
  - uspin library had PHENIX getter method in addition to normal getter method
  - It automatically correct crossing shift, but I recommend you correct XingShift by yourself:  
$$\text{updated crossing} = (\text{raw crossing} + \text{XingShift}) \% 120$$

# Spin DB Caveats – Flipped spin pattern between IP12 & IP8 (PHENIX)



- Spin pattern flips due to Siberian snake
  - Spin patterns in DB: +1 for spin up, -1 for spin down, 0 for unpolarized, and 10 for empty
  - As explained, our spin pattern measured at 12'o clock
  - For longitudinal polarized runs, Spin up becomes positive helicity therefore correction is NOT necessary
  - For transverse polarized runs, Spin flips up to down

# Star Scalers

- Simply, it is a Scaler which can accept many input at the same time
  - [https://www.phenix.bnl.gov/WWW/offline/wikioff/index.php/How\\_to\\_STAR\\_Scaler](https://www.phenix.bnl.gov/WWW/offline/wikioff/index.php/How_to_STAR_Scaler)
  - For those who study about True/Relative luminosity study you may need info in Star Scaler in addition to existing GL1p
- Library **StarScaersAuto**
  - <https://www.phenix.bnl.gov/viewvc/viewvc.cgi/phenix/offline/analysis/StarScalersAuto/>
  - Flags for Years so far (ex. Run12) are prepared by developer (A. Manion)